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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,230	01/31/2005	Jonathan Hughes	IA/3-22332/PCT	8037

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EXAMINER
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MACAULEY, SHERIDAN R

ART UNIT	PAPER NUMBER
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1651

NOTIFICATION DATE	DELIVERY MODE
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04/22/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/523,230	<b>Applicant(s)</b> HUGHES, JONATHAN	
	<b>Examiner</b> SHERIDAN R. MACAULEY	<b>Art Unit</b> 1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 December 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 13-21 is/are pending in the application.
- 4a) Of the above claim(s) 11, 14-17 and 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13 and 18-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

A response and amendment were received and entered on December 15, 2008. All arguments and evidence have been fully considered. Claims 1-11 and 13-21 are pending. Claims 11, 14-17 and 21 are withdrawn from consideration due to a previous restriction requirement. Claims 1-10, 13 and 18-20 are examined on the merits in this office action.

#### ***Claim Objections***

1. Claim objections have been withdrawn due to amendment.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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4. Claims 1-10, 13 and 18-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Brink (US Pat. 4,384,897, 1983) in view of Brelsford (US Pat. 5,411,594, 1995) and Kuo et al. (US Pat. 5,529,699, 1996; references cited in prior action). Claim 1 recites a method of producing a fermentation product comprising the steps of: (i) forming an acidified suspension of particulate plant-derived material comprising a first polysaccharide which is more readily hydrolysable and a second polysaccharide which is more difficult to hydrolyze, (ii) allowing the first polysaccharide to undergo hydrolysis by action of an acid at a temperature of at least 50 C under conditions such that the first polysaccharide is hydrolyzed and thereby forming a mixture of an aqueous liquor containing dissolved sugar and a solid residue containing the second polysaccharide, (iii) subjecting the acidic mixture to one or more separation steps in which the solid residue and aqueous sugar mixture are subsequently separated from each other, (iv) optionally washing the residue substantially free of the acid and the sugar, (v) passing the solid cellulosic residue to a further treatment stage in which the residue is subjected to the action of a dilute acid at a temperature of at least 50 C, such that the second polysaccharide is hydrolyzed and thereby forming a mixture of an aqueous liquor containing dissolved sugar and a solid residue, (vi) subjecting the acidic mixture to one or more separation stages in which the solid residue and aqueous sugar mixture are separated from each other, (vii) optionally washing the residue substantially free of the acid and the sugar, (viii) adjusting the pH of the aqueous liquor from stages (iii), (iv), (vi) and (vii) to a pH of at least 4, (ix) passing the aqueous liquor from stage (viii) to a fermentation stage where the dissolved sugars are acted upon by a

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microorganism in a fermentation broth to produce a fermentation product, and (x) separating the fermentation product from the broth, wherein the method is characterized in that the separation stage in steps (iii) and/or (vi) is assisted by flocculation of a waste by-product, employing one or more flocculation agents selected from the group consisting of water-soluble polymers, water-swellaable polymers and charged microparticulate materials, wherein the charged microparticulate material is selected from the group consisting of swellaable clays, anionic, cationic or amphoteric microparticulate silica based materials and organic crosslinked polymeric microparticles. Claim 2 recites the limitation that the plant-derived material of claim 1 comprises softwood biomass. Claim 3 recites the process of claim 1 wherein the plant-derived material is cellulosic and comprises hemicellulose as the first polysaccharide and cellulose as the second polysaccharide. Claim 4 recites the process of claim 1 wherein the acid has a pKa of below 4 and has a concentration of up to 2% by weight. Claim 5 recites the limitation that the acid of claim 1 is sulfuric acid. Claim 6 recites the process of claim 1 wherein the hydrolysis of the first polysaccharide is conducted at a temperature of between 120 and 220 C for a period of 1 minute to 15 minutes. Claim 7 recites the process of claim 1 wherein the hydrolysis of the second polysaccharide is conducted at a temperature of between 120 and 220 C for a period of 1 minute to 15 minutes. Claim 8 recites the process of claim 1 wherein the flocculating agent is a water-soluble polymer. Claim 9 recites that the polymer of claim 8 is formed from a water-soluble monomer or blend of monomers. Claim 10 recites that the polymer of claim 8 is a polyacrylate salt. Claim 13 recites the process of claim 1 wherein the

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flocculation is effected by employing a water-soluble or water-swellaable polymer and a charged microparticulate material. Claim 18 recites the limitation that the solid residue of claim 1 comprises lignin. Claim 19 recites the limitation that the fermentation product of claim 1 is ethanol. Claim 20 recites the method of claim 1 wherein the fermentation product is separated from the broth by passing the broth comprising the fermentation product into a distillation stage, where the fermentation compound is collected as a distillate and the residue "still bottoms" is removed.

5. Brink discloses a method of producing a fermentation product comprising the steps of forming an acidified suspension of particulate plant derived material comprising a first polysaccharide which is more readily hydrolysable and a second polysaccharide which is more difficult to hydrolyze (col. 1, lines 4-10; col.1 lines 16-21; col. 1 lines 36-40; col. 2, lines 32-41). Brink discloses hydrolysis of the first polysaccharide by action of an acid at a temperature of at least 50 C (col. 1, lines 16-21; col. 1, lines 36-40), subjecting the mixture to a separation step in which the solid residue and aqueous sugar mixture are separated from each other (col. 2, lines 48-52), passing the solid cellulosic residue to a further treatment stage in which the residue is subjected to the action of acid at a temperature of at least 50 C (col. 3, lines 58-63; col. 1, lines 25-27), subjecting the mixture to a separation stage in which the solid residue and aqueous sugar mixture are separated from each other (col. 4, lines 10-12), adjusting the pH of the aqueous liquor (col. 5, line 61-67), passing the aqueous liquor from a fermentation stage where the dissolved sugars are acted upon by a microorganism in a fermentation broth to produce a fermentation product (col. 1, lines 54-56), and separating the

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fermentation product from the broth (col. 1, lines 56-58). Brink teaches that the separation stages in which the solid residue and aqueous sugar aqueous sugar residue are assisted by flocculation employing a flocculation agent consisting of charged microparticulate materials (col. 10, lines 59-63). Brink teaches that the acid can be sulfuric acid (col. 9, lines 17-22), that the plant derived material is cellulosic, the first polysaccharide comprises hemicellulose and the second polysaccharide comprises cellulose (abstract), and that the solids may comprise lignin (col. 4, lines 29-35). Brink teaches that the plant material can comprise softwood biomass, i.e. woodchips prepared from papermaking, forest waste such as stumps roots, branches; one skilled in the art would recognize that this would comprise softwood as well as hardwood (col. 2, lines 32-41). Brink teaches that the fermentation product may be ethanol, and that the ethanol may be separated from the broth by distillation (col. 1, lines 54-58, col. 8, lines 44-51). Brink also teaches that the first and second hydrolysis steps are carried out at temperatures of 140 to 220 C and 160 to 240 C, respectively (col. 1, lines 16-40). Brink et al. teaches the use of sulfuric acid, which has a pKa below 4 (CRC Handbook of Chemistry and Physics, p. 8-41). Brink is silent regarding the time period used for the first and second hydrolysis steps and the concentration of acid that may be used in the method. Brink also does not teach the use of a water-soluble polymer as the flocculant, specifically one that is made from a water-soluble monomer or blend of monomers, or one that is a polyacrylate salt or flocculation using a water-soluble polymer and a charged microparticulate material. The reference does not specifically teach that the

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separation stages in which the solid residue and aqueous sugar aqueous sugar residue are conducted while the mixture is acidic.

6. Brelsford teaches a method of producing a fermentation product from lignocellulosic material comprising a two stage hydrolysis process wherein the hydrolysis of the first and second polysaccharide is conducted for 1 to 20 minutes at 135 to 195 C and 0.5 to 20 minutes at 165 to 260 C, respectively (col. 2, line 65-col. 3, line 43). Brelsford also teaches the use of 2% sulfuric acid during the hydrolysis of the first and second polysaccharides, and teaches that the lignocellulosic material may be softwood (col. 4, line 56-col. 5, line 29, col. 9, lines 4-6). Brelsford teaches that the separation stages in which the solid residue and aqueous sugar aqueous sugar residue are separated may be done while the mixture is acidic (col. 3, lines 10-27).

7. Kuo et al. teaches the use of flocculants as aids in pulp and papermaking systems (col. 9, lines 47-49). The flocculants of Kuo et al. that the flocculants can be water-soluble polymers formed from a water soluble blend of monomers, and that the flocculants can be polyacrylate salts (col. 3, lines 47-60, col. 10, lines 24-34). Kou et al. also teach that the flocculation can be effected using a water-swellaable polymer and a charged microparticulate material (note that several of the suitable particulates taught by the reference are charged particles, e.g. clay and alumina; col. 9, line 56-col. 10, line 12).

8. At the time of the invention, a method of producing a fermentation product comprising steps nearly identical to the claimed process steps was known in the art, as taught by Brink et al. It was also known in the art that dilute sulfuric acid could be used



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in the hydrolysis step, and that the hydrolysis claimed hydrolysis time could be used. It was further known that the claimed water soluble polymers, specifically in combination with charged microparticulates could be used for the separation of pulp in papermaking systems, as taught by Kuo et al. The motivation to combine the teachings discussed above is provided by Brelsford et al., who teach that the two-stage hydrolysis using dilute acid reduces the amount of time and energy required for the conversion of cellulose to glucose (col. 4, lines 25-40), and also by Kuo, who teaches that the charged polymers are desirable for use as flocculants because their charge is pH-independent (col. 3, lines 26-29), which would be desirable in the method taught by Brink et al. because it is conducted under acidic conditions. One would have been motivated to use the flocculants of Kuo for separation while the mixture was acidic because Brelsford teaches that the solid residue and aqueous sugar aqueous sugar residue may be separated while the mixture is acidic; one of ordinary skill in the art would therefore have recognized that it would be desirable to conduct a separation stage without neutralizing the solution, particularly because a pH-independent flocculant was known in the art at the time of the invention, as taught by Kuo, and there was a desire in the art to reduce the time and energy required for the conversion of cellulose to glucose, as taught by Brelsford. One skilled in the art would have had a reasonable expectation of success in combining the teachings discussed above because the hydrolysis and fermentation methods taught by the references are well known in the art and both methods use the same starting material, i.e. lignocellulosic material, to produce sugars which are used for the production of a fermentation product. Further, the methods of

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Brink and Kuo et al. both use flocculants for the same purpose, i.e. the separation of lignocellulosic material (note that this would be implicit to the teachings of Kuo et al., who disclose using the flocculants as drainage/retention aids for pulp in papermaking). It would therefore have been obvious to one of ordinary skill in the art to combine the teachings discussed above to arrive at the claimed invention.

9. Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

### ***Double Patenting***

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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11. Claims 1-3, 5, 8-10 and 13 and 18-20 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4, 5, 7, 8, 10 and 11 of copending Application No. 10/523229 in view of Brink (US Pat. 4,384,897, 1983) and Kuo et al. (US Pat. 5,529,699, 1996). Claims 4, 5, 7, 8, 10 and 11 of copending Application No. 10/523229 are directed to a method of producing a fermentation product nearly identical to the method claimed in the cited claims of the instant application. The claims of the copending application do not recite first hydrolyzing readily hydrolysable polysaccharides and to subsequently hydrolyzing polysaccharides which are more difficult to hydrolyze. The teachings of Brink and Kuo are discussed above, who teach the additional limitations claimed by the instant application. The motivation to combine these teachings is provided by Brink, who teaches that the 2-stage process enhances the yield of sugars from lignocellulosic materials. One of ordinary skill would have a reasonable expectation of success in using the 2 stage process of Brink in the process claimed in the copending application because the process of Brink was known to be effective in the claimed process of the production of a fermentation product, as discussed above. The cited claims of the instant application are therefore rendered obvious in view of the copending application and the prior art.

12. This is a provisional obviousness-type double patenting rejection.

13. Claims 1-10, 13, and 18-20 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4, 5,

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7, 8, 10 and 11 of copending Application No. 10/523229 in view of Brink (US Pat. 4,384,897, 1983) and Kuo et al. (US Pat. 5,529,699, 1996), and further in view of Brelsford (US Pat. 5,411,594, 1995). The claims of the copending application and the teachings of Brink are discussed above; these references do not teach the use of an acid with a concentration up to 2%, or the time periods for the hydrolysis of the first and second polysaccharides. The additional limitations claimed by the instant application are taught by Brink and Brelsford, as discussed above. The motivation to combine these teachings is discussed above. The cited claims of the instant application are therefore rendered obvious in view of the copending application and the prior art.

14. This is a provisional obviousness-type double patenting rejection.

15. Applicant's desire to postpone the submission of terminal disclaimers until all other rejections have been overcome is noted. Therefore, the provisional rejections on the ground of obviousness-type double patenting stand until such a time.

### ***Response to Arguments***

16. Applicant's arguments filed December 15, 2008 have been fully considered but they are not persuasive. Applicant argues that the claimed invention is not taught or rendered obvious by the cited references because the combined references do not teach separation of the solid residue and aqueous liquor by flocculation while the mixture is acidic. However, Brelsford teaches that the separation stages in which the solid residue and aqueous sugar aqueous sugar residue are separated may be done

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while the mixture is acidic. One of ordinary skill in the art would have been motivated to use the flocculants of Kuo for separation while the mixture was acidic because a pH-independent flocculant was known in the art at the time of the invention, as taught by Kuo, and there was a desire in the art to reduce the time and energy required for the conversion of cellulose to glucose, as taught by Brelsford. One would therefore have recognized that it would be desirable to conduct a separation stage without neutralizing the solution. Although applicant further argues that one would not have been motivated to conduct the separation while the mixture was acidic because the flocculant of Brink could not have functioned under acidic conditions, it is noted that Kuo teaches that a pH-independent flocculant could be used in similar systems. One would therefore have recognized that it would have been desirable to use to flocculant of Kuo in the combined method of the prior art. Further, in response to applicant's argument that Kuo teaches away from the use of the flocculants under acidic conditions, it is noted that the reference teaches that the flocculants are pH-independent. Regardless of a teaching that the flocculant might not have been as effective at an acidic pH, the reference teaches that it could have been used in the claimed conditions. Therefore, applicant's arguments have been fully considered, but they have not been found to be persuasive.

### ***Conclusion***

17. No claims are allowed.

18. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHERIDAN R. MACAULEY whose telephone number is (571)270-3056. The examiner can normally be reached on Mon-Thurs, 7:30AM-5:00PM EST, alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on (571) 272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SRM

/Ruth A. Davis/  
Primary Examiner, Art Unit 1651